

PREVALENCE OF METABOLIC SYNDROME AMONG PATIENTS WITH SCHIZOPHRENIA FROM LONG CARE UNIT IN FORENSIC PSYCHIATRY PROGRAM: AN OBSERVATIONAL STUDY

Javed Ather Siddiqui,^{1,3} Shazia Farheen Qureshi,^{2,3} Hani Matrok Alotaibi,^{3,4} Waleed Mohsen Alkhamash.^{3,4}

Correspondence: javedsiddiqui2000@gmail.com

¹Department of Psychiatry, Seth Gordhandas Sunderdas Medical College and the King Edward Memorial Hospital, Mumbai 400012, India; ²Department of Psychiatry, College of Physicians and Surgeons of Bombay, Mumbai 400012, India; ³Department of Psychiatry, Eradah & Mental Health Complex - Taif, 21944, Saudi Arabia; ⁴ Saudi Board of Psychiatry, Saudi Arabia.

RESEARCH

OPEN ACCESS

ABSTRACT

Introduction – Metabolic syndrome is a leading health concern among schizophrenia patients treated with antipsychotics. The morbidity and mortality rates of these patients can increase when they already have cardiovascular disease and other risk factors. This study aimed to examine the prevalence of metabolic syndrome and its relationship to various clinical parameters such as blood pressure, fasting blood glucose, triglycerides, high-density lipoprotein, and waist circumference.

Methods – This disease-oriented observational study was carried out in the forensic psychiatric rehabilitation ward at the Eradah & Mental Health Complex - Taif, Saudi Arabia. Patients admitted to the inpatient ward between 2018 and 2023 participated in the study (N = 71). The relationship between metabolic syndrome and psychotropic medications was also examined. Schizophrenia was defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR) criteria. Metabolic syndrome was assessed based on the international criteria National Cholesterol Education Program's Adult Treatment Panel III report (ATPIII) criteria and AHA/NHLB.

Results – In this study, 71 volunteer schizophrenic patients were included, and an observational study over five years was conducted. We found the total number of metabolic syndrome patients was 40 (56.34%) compared with 31 (43.66%) patients without metabolic syndrome. The majority of metabolic syndrome patients (57.50%) were aged 41 to 50. The highest number of patients suffering from metabolic syndrome are those taking atypical antipsychotic medications. Among antipsychotic medications, aripiprazole was found the maximum number of 10 (25%) followed by olanzapine 7 (17.5%). Maximum number of metabolic syndrome parameters increased fasting blood sugar 26 (65%) followed by increased body mass index 21 (52.5%).

Discuss – This research can contribute to the study of the prevalence of metabolic syndrome among patients with schizophrenia. In the present study, the prevalence of metabolic syndrome was 56.34 percent in schizophrenia. There are several metabolic side effects associated with second-generation antipsychotics and if these aren't treated properly, they can lead to serious health complications, such as diabetes, dyslipidemia, and fatal heart disease.

Conclusion – In our study, metabolic syndrome was most prevalent among patients between 41 - 50 years of age. Therefore, clinicians are encouraged to screen and monitor metabolic syndrome and treat cardio-metabolic risk factors for optimum long-term management.

Keywords: schizophrenia, metabolic syndrome, antipsychotics.

Article History:

Received: February 6, 2024

Accepted: March 4, 2024

Published: March 31, 2024

Cite this as: Siddiqui, J.A., Qureshi, S.F., Alotaibi, H.M., Alkhamash, W.M. Prevalence of Metabolic Syndrome Among Patients with Schizophrenia from Long Care Unit in Forensic Psychiatry Program: an Observational Study. *Journal of Psychiatry Psychology and Behavioral Research*; 2024;5:1. p1-6.

INTRODUCTION

The metabolic syndrome refers to a group of conditions, including diabetes, hypertension, dyslipidemia, and obesity that may increase cardiovascular disease risk.¹ It is characterized by several variables, including central obesity, high blood pressure, low levels of high-density lipoprotein (HDL) cholesterol, elevated triglycerides, and elevated blood sugar levels.² The prevalence of metabolic syndrome among

schizophrenia patients has been reported in numerous studies. The prevalence of metabolic syndrome is estimated to be 30 percent in patients with psychotic disorders,³ 10 percent in diabetes mellitus,⁴ and 20 percent in hypertension.⁵ A metabolic syndrome diagnosis is made based on the criteria in the Adult Treatment Panel III report (ATPIII) of the National Cholesterol Education Program. It was defined as metabolic syndrome when three or more of the following conditions were present in a subject: Waist Circumference(WC ≥ 102) cm in

men and ≥ 88 cm in women, Triglycerides (TG ≥ 150) mg/dl, High-density lipoprotein cholesterol (HDL-C < 40) mg/dl in men and < 50 mg/dl in women; elevated blood pressure (systolic ≥ 130 and/or diastolic ≥ 85 mm Hg; antihypertensive drug treatment in a patient with a history of hypertension was used as an alternate indicator); and elevated fasting glucose ≥ 100 .⁶

In schizophrenia, the most common cause of death is cardiovascular disease.⁷ A sedentary lifestyle, genetic vulnerability, smoking, and antipsychotic medication are associated with a higher cardiovascular mortality rate among schizophrenic patients.⁸ The prevalence of metabolic syndrome is increased by antipsychotic-induced weight gain.^{9, 10} There are several metabolic side effects associated with second-generation antipsychotics and if these aren't treated properly, they can lead to serious health complications, such as diabetes, dyslipidemia, and fatal heart disease.¹¹ Predisposing risk factors for metabolic syndrome in schizophrenia patients include long-term antipsychotic medication use, poor diet, and low physical activity.¹² It is therefore imperative to study the prevalence of metabolic syndrome in specific contexts to decrease physical health comorbidities and consequential premature deaths. The metabolic syndrome has been linked to cognitive and functional impairments in recent clinical studies.^{13, 14}

The risk of metabolic syndrome is higher in schizophrenia patients who have been ill for more than 10 years,¹⁵ and those who take antipsychotic treatment for more than 6 months.¹⁶ The majority of these studies do not examine the clinical variables that may contribute to metabolic syndrome in schizophrenia patients taking antipsychotics. Thus, the present study aims to investigate whether antipsychotic medication users are at risk for metabolic syndrome. It also studies its association with socio-demographic factors and clinical variables.

METHOD

Participants

Study participants included male inpatients unit at the Eradah & Mental Health Complex - Taif, Saudi Arabia, who were in the rehabilitation forensic psychiatry wards. Participants were all on psychotropic medications for five years, from April 2018 to May 2023.

Parameters

A semi-structured proforma was used to evaluate the socio-demographic and clinical characteristics of patients using psychotropic medications. We also evaluated the association between metabolic syndrome and psychotropic medications. We also collected data on metabolic syndrome by interviewing patients who take psychotropic medications. Furthermore, we conducted physical examinations and collected laboratory data over the last five years.

Inclusion criteria

1. A group of diagnosed psychiatric cases based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR) diagnostic criteria, in which adult patients received psychotropic medications such as antidepressants, antipsychotics, and mood stabilizers.
2. Patients who have participated in the study are from the chronic forensic rehabilitation unit.

3. All participants who took psychotropics during the past five years were included in the study.

Exclusion criteria

1. Female patients.
2. Age range of participants below 30 years.

Sampling technique

Researchers used a purposeful sampling strategy to select participants from the mental health hospital in Taif, Saudi Arabia. The sample size was N = 71, which included only male participants. Metabolic syndrome variables such as WC ≥ 102 cm in men and ≥ 88 cm in women, TG ≥ 150 mg/dl (drug treatment for elevated triglycerides was used as an alternate indicator), HDL-C < 40 mg/dl in men and < 50 mg/dl in women; elevated blood pressure (systolic ≥ 130 and/or diastolic ≥ 85 mm Hg studied in schizophrenic patients those are taking psychotropic medications).

We determine the prevalence of metabolic syndrome in schizophrenic patients over the last five years. The study included all inpatients meeting the inclusion criteria who were diagnosed with a psychiatric illness and receiving psychotropic medications, or a combination of these psychiatric medications.

Research instrument

An objective of this study was to determine the socio-demographic profile and variables of metabolic syndrome among the study population in conjunction with psychotropic drugs, as well as combinations of these drugs. Researchers filled out these forms while observing and evaluating patients receiving psychotropic medications in metabolic syndrome.

Ethical issues in research

This study was approved by the Ethical Committee of the Research and Studies Department, Directorate of Health Affairs, Taif, Saudi Arabia. IRB Registration Number with KACST, KSA: HAP-02-T-067, approval number: 874.

Data analysis and methodology

Microsoft Excel software was used to perform the statistical analysis. The categorical variables were observed as frequency and percentage using descriptive statistical analysis. After obtaining written informed consent, all patients age 31 to 65 who were taking psychotropic medications were interviewed. Consent was obtained in Arabic, which the patient understood, and they were free to accept or reject the study. During this study, a self-designed questionnaire was used to gather general information. It also contributes to data collection and covers study objectives. In the study of 71 patients taking psychotropic medications. 40 had metabolic syndrome, while 31 displayed normal laboratory findings without metabolic syndrome.

RESULT

This study was conducted in the chronic rehabilitation ward in the forensic psychiatric department. The total number of psychiatric patients monitored was 71, of which 40 patients had metabolic syndrome (56.34 %) and 31 patients were normal, as shown in Figure 1. The baseline and demographic characteristics of the patients are shown in Table 1. Among 40

patients suffering from metabolic syndrome, 23 (57.5%) were between the ages of 41-50, followed by 9 (22.5%) who were more than 50 years old, and 8 (20%) were between the ages of 31- 40 years. All of the patients in the study were males. The prevalence of metabolic syndrome was slightly higher in

married patients 36 (50.70%) than in unmarried patients 35 (49.30%).

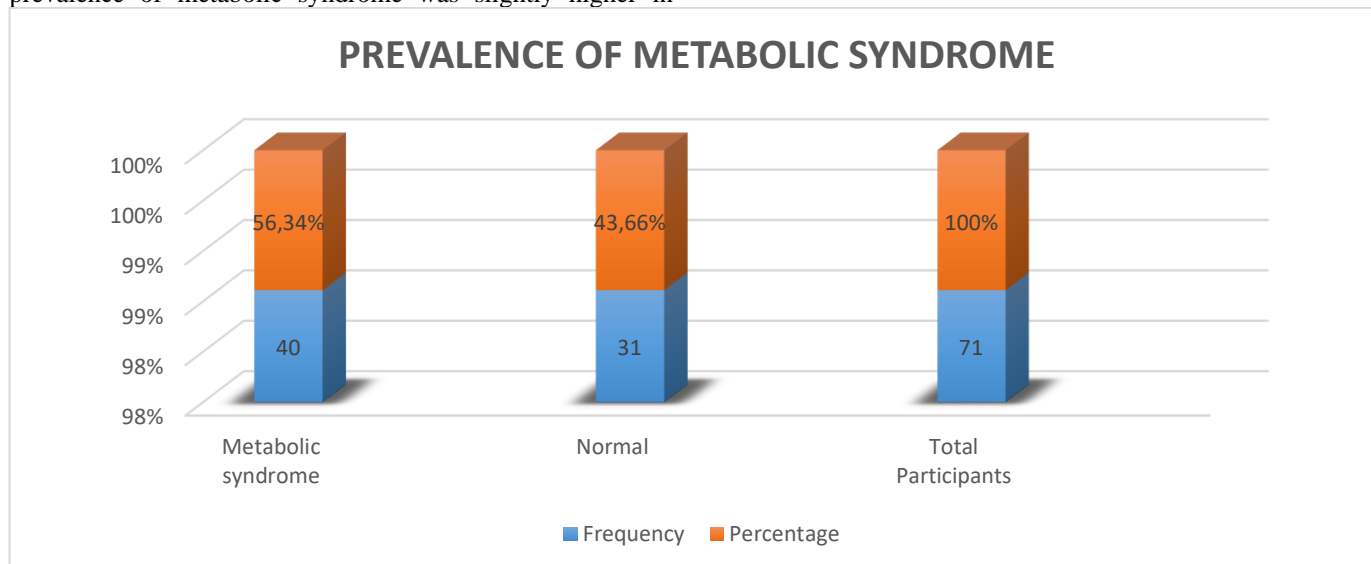


Figure 1. Prevalence of metabolic disorders in psychotropic medications taking patient.

Table 1. Distribution of total subjects by socio-demographic characteristics.

| Age distribution | | |
|----------------------|-----------|------------|
| Age in Years | Frequency | Percentage |
| 20-30 | 0 | 0 |
| 31-40 | 8 | 20 |
| 41-50 | 23 | 57.5 |
| >50 | 9 | 22.5 |
| Total N=40 | 40 | 56.34% |
| Gender | | |
| Male | 40 | 56.34 |
| (Metabolic syndrome) | | |
| Male | 31 | 43.66 |
| (Normal) | | |
| Female | 0 | 0 |
| Total N=71 | 71 | 100% |
| Marital Status | | |
| Married | 36 | 50.7 |
| Unmarried | 35 | 49.3 |
| Total N=71 | 71 | 100% |
| Occupation | | |
| Employed | 16 | 22.23 |
| Unemployed | 55 | 78.87 |
| Total N=71 | 71 | 100% |

Table 2. Association between type of antipsychotics and metabolic syndrome

| Types of single antipsychotics cause metabolic syndrome | | |
|---|-----------|----------------|
| Antipsychotics | Frequency | Percentage (%) |
| Aripiprazole | 10 | 25 |
| Clozapine | 4 | 10 |
| Haloperidol | 3 | 7.5 |
| Olanzapine | 7 | 17.5 |
| Quetiapine | 2 | 5 |
| Risperidone | 3 | 7.5 |
| Amisulpiride | 5 | 12.5 |
| Paliperidone | 4 | 10 |
| TOTAL | | 100% |
| Combinations of antipsychotics cause metabolic syndrome | | |
| No of substances | Frequency | Percentage (%) |
| Amisulpiride + Aripiprazole | 3 | 7.5 |
| Risperidone + Aripiprazole | 1 | 2.5 |

Table 3. Variable (parameters) of metabolic syndrome

| Variable (parameters) of metabolic syndrome | | |
|---|-----------|----------------|
| Variables | Frequency | Percentage (%) |
| Elevated body mass index (BMI) | 21 | 52.5 |
| Low level of High-density lipoprotein cholesterol (HDL-C) | 9 | 22.5 |
| Triglycerides (TGL) | 18 | 45 |
| Elevated systolic blood pressure (SBP) | 15 | 37.5 |
| Elevated systolic blood pressure (SBP) | 8 | 20 |
| Elevated fasting blood glucose (FBS) | 26 | 65 |
| TOTAL | | 100% |

The prevalence of metabolic syndrome among patients with schizophrenia treated with antipsychotics is shown in Table 2. Maximum numbers of patients were taking atypical antipsychotic medication 39 (97.5%), as compared with typical antipsychotic medication 3 (7.5%). Among atypical antipsychotic medications, aripiprazole was found in maximum numbers 10 (25%) followed by olanzapine 7 (17.5%), then amisulpride 5 (12.5%), clozapine and paliperidone 4 (10%) respectively. Medications with more than one psychotropic were those taking amisulpride with aripiprazole 3 (7.5%) followed by 1 (2.55) risperidone with aripiprazole taking patients.

Table 3 shows the various clinical parameters of metabolic syndrome participants. Among patients with increased fasting blood sugar 26 (65.0%) and increased body mass index 21 (52.5%) were diagnosed with diabetes mellitus. Increased systolic blood pressure was found among 15 patients with 37.5 percent diagnosed with hypertension. There were 18 patients with a high triglyceride level of 45 percent, and 9 patients with a low level of high-density lipoprotein (HDL-C) cholesterol of 22.5 percent who were diagnosed with dyslipidemia.

DISCUSS

This was a hospital-based observational study carried out on patients diagnosed with schizophrenia attending the psychiatric male inpatient unit at the Erada & Mental Health Complex - Taif, Saudi Arabia. These patients were in the rehabilitation forensic psychiatry wards. The study was mainly done to assess the prevalence and correlates of metabolic syndrome among patients with schizophrenia treated with antipsychotic medications. Several clinical implications should be followed. First, there is an urgent need to develop clinical interventions including diet and physical activity to reverse and control metabolic abnormalities in schizophrenia cases. Second, to establish a system for continuous monitoring and surveillance of metabolic abnormalities in schizophrenia cases. Mental health institutions and family physicians must collaborate to address these implications. Thirdly, to promote awareness about metabolic syndromes and to encourage mental health staff to consider patients with schizophrenia and related disorders' physical health. To prevent metabolic syndrome, future research needs to focus on its causes.

Various studies have been conducted on the prevalence of metabolic syndrome in Vietnam¹⁷ and Australia,¹⁸ which found a high prevalence of 68% and 86%, respectively. A few studies have examined metabolic syndrome in cases of schizophrenia in Arab patients. A cross-sectional study of 63 cases in Egypt found a 38% prevalence of metabolic syndrome based on IDF diagnostic criteria.¹⁹ However, in our sample, we found that the metabolic syndrome prevalence rate is 56.34%. It may be because patients live different lifestyles that these

CONCLUSION

In schizophrenia patients with metabolic syndrome, high waist circumference and low HDL are common after six months of antipsychotic medication. As a result, patients with schizophrenia taking multiple medications should be regularly monitored to determine if they are suffering from metabolic syndrome. It is important to consider risk factors among schizophrenia patients who are taking antipsychotic medication, and nutrition and lifestyle interventions must also

discrepancies occur. A metabolic syndrome is characterized by obesity, hypertension, and dyslipidemia, which raises the risk of type 2 diabetes mellitus and cardiovascular disease. Metabolic syndrome is estimated to be present in a large majority of patients with type 2 diabetes or impaired glucose tolerance.²⁰ In our study similar findings noted the maximum number of patients suffering from diabetes mellitus with 65 percent, followed by dyslipidemia and hypertension. In our study, all participants were male patients, despite the prevalence rates of the metabolic syndrome being noted in both genders.

The precise causes of metabolic syndrome prevalence in schizophrenia patients are unknown but some mechanisms have been proposed. Poor dietary habits and a sedentary lifestyle in these patients can increase the risk of obesity, particularly abdominal obesity, due to the side effects of antipsychotic medications.^{21, 22} In our study patients were in a chronic rehabilitation ward with poor dietary habits and decreased physical activity. As a result, metabolic parameters increased day by day, supporting this hypothesis.

As reported in other studies, schizophrenia patients had a higher incidence of diabetes than the general population.^{23, 24} In our study, the majority of patients with increased fasting blood sugar 26 (65.0%), followed by increased body mass index 21 (52.5%) were diagnosed with diabetes mellitus.

Limitations and suggestions for future research

This was disease-oriented observational study was carried out in the forensic psychiatric rehabilitation ward at the Mental Health Hospital, Taif, Saudi Arabia. This study was carried out in the forensic chronic rehabilitation unit for the first time, and it will help lower potential risks in the future. There are some limitations of this research study. The study's limitations are as follows (1) female participants were not included in this study, as it was done on the male chronic rehabilitation ward; (2) There was no control group. Hence, it is difficult to generalize this finding to the general population.

Initially, it should be noted that this is an observational study, and longer-term research is required to fully evaluate the impact of psychiatric medication on metabolic syndrome, so longitudinal studies are needed. In this research study the prevalence of metabolic syndrome was found high because of the small sample size. Therefore, further study with a large number of patients is required to figure out the prevalence of metabolic syndrome in these individuals. In the future, glycated hemoglobin (HbA1c) measurements could be made to get a more accurate assessment of the prevalence of diabetes mellitus in the research environment. Finally, the majority of the patients were using aripiprazole and olanzapine, which made it difficult to determine how different antipsychotics affected the risk of metabolic syndrome and its components in this specific setting.

be implemented. It was found that metabolic syndrome is more prevalent in schizophrenia patients and those taking antipsychotics of the second generation. A physician should monitor metabolic parameters such as waist circumference regularly, as well as check for medication-related weight gain. Furthermore, antipsychotics should be changed whenever necessary to prevent an increase in mortality.

Conflict of interest

The authors declared there was no conflict of interest.

Author contribution

JAS- material preparation, conception and design, or acquisition of data, or analysis and interpretation of data, SFQ- draft of the manuscript was written, drafting or revising it critically for significant intellectual content. HMA & WMA- Critical review and editing of the final manuscript was done.

Acknowledgments

Especially thanks to the Unit Manager of nursing staff of Department of Forensic Psychiatry Ali Saud Alnefehi and the team of our hospital for providing support in arranging this study.

REFERENCES

1. Rezaianzadeh A, Namayandeh SM, Sadr SM. National Cholesterol Education Program Adult Treatment Panel III Versus International Diabetic Federation Definition of Metabolic Syndrome, Which One is Associated with Diabetes Mellitus and Coronary Artery Disease? *Int J Prev Med.* 2012; 3(8):552–558. <https://pubmed.ncbi.nlm.nih.gov/22973485/>
2. Kaur J. A comprehensive review on metabolic syndrome. *Cardiol Res Pract.* 2014;2014(943162):1-21. <https://doi.org/10.1155/2014/943162>.
3. Mitchell AJ, Vancampfort D, Sweers K, Winkel R van, Yu W, Hert MD. Prevalence of Metabolic Syndrome and Metabolic Abnormalities in Schizophrenia and Related Disorders—A Systematic Review and Meta-Analysis. *Schizophr Bull.* 2013;39(2):306. <https://doi.org/10.1093/schbul/sbr148>
4. Vancampfort D, Correll CU, Galling B, Probst M, De Hert M, Ward PB, et al. Diabetes mellitus in people with schizophrenia, bipolar disorder and major depressive disorder: a systematic review and large scale meta-analysis. *World Psychiatry.* 2016; 15(2):166–174. <https://doi.org/10.1002/wps.20309>
5. Goldstein BI, Fagiolini A, Houck P, Kupfer DJ. Cardiovascular disease and hypertension among adults with bipolar I disorder in the United States. *Bipolar Disord.* 2009; 11(6):657–662. <https://doi.org/10.1111/j.1399-5618.2009.00735.x>
6. Grundy SM, Brewer Jr HB, Cleeman JJ, et al. Definition of metabolic syndrome: report of the national heart, lung, and blood institute/american heart association conference on scientific issues related to definition. *Circulation.* 2004; 109: 433-438. <https://doi.org/10.1161/01.CIR.0000111245.75752.C6>.
7. Sweileh WM, Zyoud SH, Dalal SA, et al. Prevalence of metabolic syndrome among patients with schizophrenia in Palestine. *BMC Psychiatry.* 2012; 12: 235. <https://doi.org/10.1186/1471-244X-12-235>.
8. Sugawara N, Yasui-Furukori N, Sato Y, et al. Prevalence of metabolic syndrome among patients with schizophrenia in Japan. *Schizophr Res.* 2010; 123: 244-250. <https://doi.org/10.1016/j.schres.2010.08.030>.
9. Hennekens CH, Hennekens AR, Hollar D, Casey DE. Schizophrenia and increased risks of cardiovascular disease. *Am Heart J.* 2005; 150:1115-1121. <https://doi.org/10.1016/j.ahj.2005.02.007>.
10. De Hert M, Correll CU, Bobes J, Cetkovich-Bakmas M, Cohen D, Asai I, et al. Physical illness in patients with severe mental disorders. I. Prevalence, impact of medications and disparities in health care. *World Psychiatry.* 2011;10(1):52-77. <https://doi.org/10.1002/j.2051-5545.2011.tb00014.x>.
11. Siddiqui JA, Qureshi SF, Alghamdi IM, Alotaibi HM. Metabolic syndrome: a psychiatric outlook. *Psychosom Med Res.* 2023;5(1):1. <https://doi.org/10.53388/PSMR2023>.
12. Vancampfort D, Stubbs B, Mitchell AJ, et al. Risk of metabolic syndrome and its components in people with schizophrenia and related psychotic disorders, bipolar disorder, and major depressive disorder: A systematic review and meta-analysis. *World Psychiatry.* 2015;14(3):339-347. <https://doi.org/10.1002/wps.20252>.
13. Bora E, Akdede BB, Alptekin K. The relationship between cognitive impairment in schizophrenia and metabolic syndrome: A systematic review and meta-analysis. *Psychol Med.* 2017;47(6):1030-1040. <https://doi.org/10.1017/S0033291716003366>.
14. Yates KF, Sweat V, Yau PL, et al. Impact of metabolic syndrome on cognition and brain: A selected review of the literature. *Arterioscler Thromb Vasc Biol.* 2012;32(9):2060-2067. <https://doi.org/10.1161/ATVBAHA.112.252759>.
15. De Hert M, van Winkel R, Van Eyck D, Hanssens L, Wampers M, Scheen A, et al. Prevalence of diabetes, metabolic syndrome and metabolic abnormalities in schizophrenia over the course of the illness: A cross-sectional study. *Clin Pract Epidemiol Ment Health.* 2006; 2:14. <https://doi.org/10.1186/1745-0179-2-14>.
16. Bajaj S, Varma A, Srivastava A, Verma AK. Association of metabolic syndrome with schizophrenia. *Indian J Endocrinol Metab.* 2013;17(5):890-895. <https://doi.org/10.4103/2230-8210.117238>.
17. Ogbera AO. Prevalence and gender distribution of the metabolic syndrome. *Diabetol Metab Syndr.* 2010; 2(1):1. <https://doi.org/10.1186/1758-5996-2-1>.
18. Tirupati S, Chua L-E. Obesity and metabolic syndrome in a psychiatric rehabilitation service. *Aust NZ J Psychiatry.* 2007;41(7):606–610. <https://doi.org/10.1080/00048670701392841>.
19. Hatata H, El Gohary G, Abd-Elsalam M, et al. Risk of metabolic syndrome among Egyptian patients with schizophrenia. *Curr Psychiatry.* 2010;16:85-95. <https://psychiatry-research-eg.com/texts/current-psychiatry-v15n3-08/9en.pdf>
20. Isezuo SA, Ezunu E. Demographic and clinical correlates of metabolic syndrome in Native African type 2 diabetic patients. *J Natl Med Assoc.* 2005, 97 (4): 557-563. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2568734/>
21. Ryan MC, Thakore JH. Physical consequences of schizophrenia and its treatment: the metabolic syndrome. *Life Sci.* 2002; 71(3): 239-257. [https://doi.org/10.1016/s0024-3205\(02\)01646-6](https://doi.org/10.1016/s0024-3205(02)01646-6).
22. Thakore J, Mann J, Vlahos I, Martin A, Reznick R. Increased visceral fat distribution in drug-naïve and drug-free patients with schizophrenia. *Int J Obes Relat Metab Disord.* 2002; 26(1): 137-141. <https://doi.org/10.1038/sj.ijo.0801840>.
23. Hanley AJ, Karter AJ, Williams K, et al. Prediction of type 2 diabetes mellitus with alternative definitions of the metabolic syndrome: the Insulin Resistance

Atherosclerosis Study. *Circulation* 2005; 112(24): 3713-3721.
<https://doi.org/10.1161/CIRCULATIONAHA.105.559633>

24. Shafie S, Lee SP, Ong SBC, et al. Prevalence and correlates of diabetes mellitus and dyslipidemia in a long-stay inpatient schizophrenia population in Singapore. *Singapore Med J*. 2018; 59(9): 465-471.
<https://doi.org/10.11622/smedj.2018020>.